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# BELL

telephone magazine



A Man and His City Page 36







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ON THE COVER — Ray Garcia is a man deeply committed to his community, East Los Angeles, Calif. Ray, who expresses his views on the involvement of business and the individual in the problems of the city starting on page 38, has recently been appointed field deputy of Lt. Governor Robert Finch and will soon be taking a leave of absence from Pacific Telephone to serve in a liaison capacity between the Spanish-speaking community and state officials.

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Big savings—\$30,000,000 last year—result from programs that assure accurate reporting, adequate recognition and management support

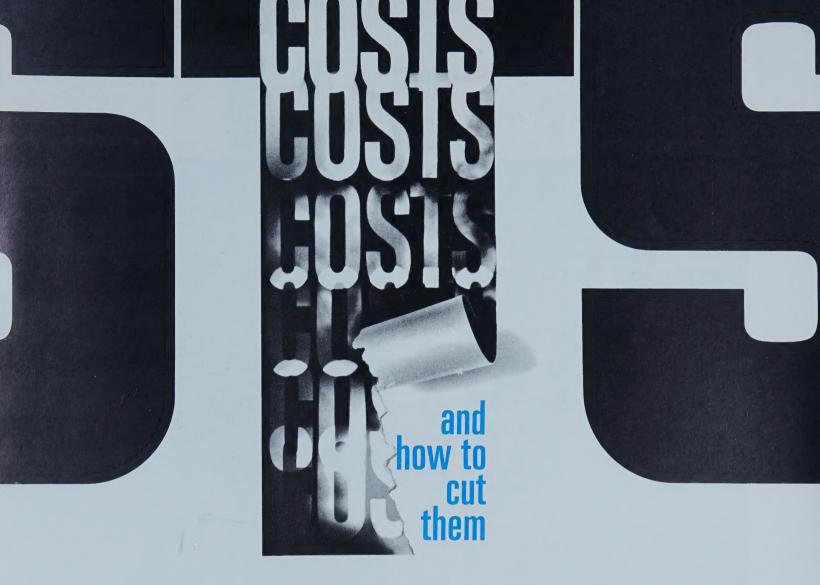
It was a \$2 million a year victory in the war on costs—substitution of factory-grown, artificial quartz crystals to replace the costly, hard-to-get natural material. But Bill Watson, an engineer at Western Electric's Merrimack Valley Works in North Andover, Mass., had no time to cheer.

Despite the savings in material costs, the tall engi-

neer knew there must be better ways of testing the crystal units that are used to control frequencies in transmission systems. "The trouble was, if something went wrong in making the units, feedback of the cause was critically delayed — even an hour would be too long. By then the damage was done; a whole batch of crystals might be ruined."

After long hours of study, Bill submitted a proposal for an on-line, real-time computerized testing system to the plant's cost reduction committee. The committee liked what it heard: "the use of new technology for process control, audit and quality reports — now, while it's happening," and estimated savings of about a half a million dollars a year.

The experience of Bill Watson is typical of hundreds of engineers in the Bell System's manufacturing and supply unit, which last year processed 5,983 cost-



cutting proposals. And most of these recommendations came from engineers who consider finding new ways of producing quality products at less cost — and keeping the cost of telephone service down — "a way of life," as Watson puts it.

Like other manufacturers—and industry in general—one of the biggest hurdles that Western Electric has faced in its pursuit against rising labor and material costs is the need to create cost awareness and a climate of change and innovation. But over the years—its formal cost reduction program dates back to the mid twenties—Western has been able to instill in its engineers an attitude that changes designed to make a product at less cost are as necessary as meeting production schedules, attaining quality performance standards, or introducing new products.

"We've found that we must put the responsibility

for cost reductions squarely on the shoulders of the product and planning engineer," says Quentin W. Wiest, general manager for engineering at Western Electric. "Give him the responsibility and hold him accountable, and he'll come through.

"It's only natural to give the primary responsibility to the engineer. After all, the philosophy of low costs starts with good engineering, or what we call cost avoidance . . . making sure you have effectively engineered the job so the item is produced at the lowest possible cost right from the start. By giving him the responsibility, you can make the best use of his talents and he can demonstrate his professional competence," explains Wiest.

"I don't believe full-time cost reduction specialists are the best way to achieve cost reduction. It is perfectly true that other duties command the engineer's attention as well as cost reduction, but this doesn't come close to offsetting the benefits of the intimate knowledge of the product or planning engineer who works on the job. The product engineer who lives with cost problems is the expert . . . even though he may freely consult specialists," Mr. Wiest says.

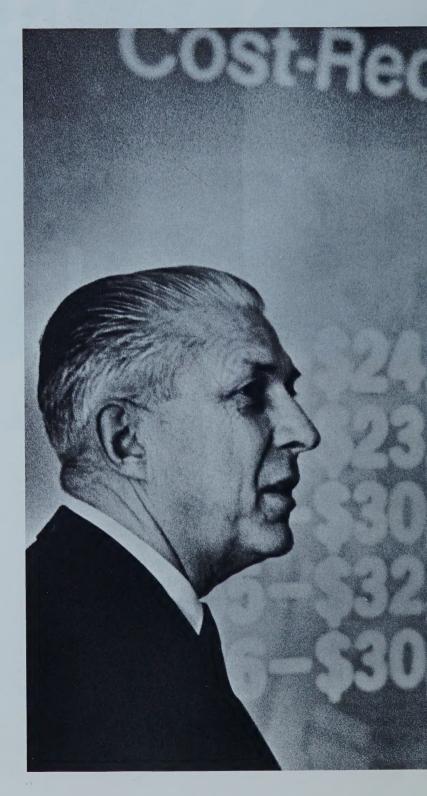
Western Electric has learned that a good cost reduction program is not a hit-and-miss proposition. Down through the years, it has formalized the program through the evolution of a series of scientific guidelines designed to make sure the company is really saving money through cost reduction proposals, and to establish an equitable means of giving credit to the individuals and organizations who are responsible for the work.

"When you formalize a program like this, you get a commitment from top management, and at the same time, set up the necessary management controls," points out William G. Seyter, who is in charge of coordinating cost reduction at Western Electric's headquarters in New York. "With appropriate controls, you can determine if estimated savings are actually attainable. You've got to be careful, though, that you don't get involved with so much red tape that you inhibit and frustrate the effort. Burdensome controls can be as bad as no controls."

How does the program work? Bill Watson's proposal for computerized testing is an example:

The quartz crystal unit shop used a system of tab cards to help evaluate the reasons why some batches of tiny crystal units do not measure up to the superfine degrees of tolerance needed to control frequencies in transmission systems. The tab cards are slow: it usually takes about a week to collect and process the data. By then defects have occurred and many units may be ruined.

"It seemed to me," Watson reports, "that modern computer technology could be put to use to improve our process methods and quality control. After some preliminary study, I reviewed it with four other groups that were involved, and after estimating the







"Western Electric's cost reduction program is based on the premise that engineering effort, beyond that necessary to make the product, is worth every cent it costs, but savings must exceed costs," states Quentin W. Wiest, general manager for engineering.

"Management at all levels must have compelling, practical reasons for stimulating cost reduction and ensuring the program's continuance as a traditional element of the Company's operations."





"Ordinarily, good engineering—a gathering of new materials, new methods, new developments and new skills under new conditions at the right time—characterizes the most significant cost reductions."



"Secondary but indispensable factors are good engineering supervision, successful group effort spearheaded by the product engineer involved, and a cost-conscious management willing to cope with change."

savings and how much the new process would cost, went to the cost reduction committee."

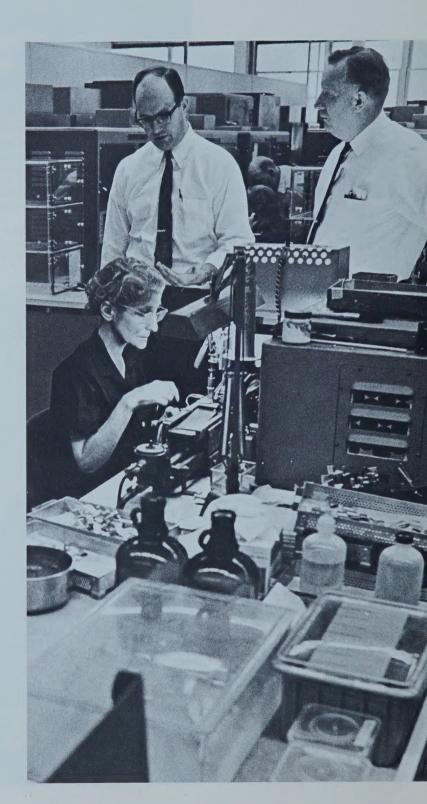
The committee, composed of top engineering management and representatives from other groups in the plant, agreed to recommend spending about \$530,000 to purchase new equipment, rearrange the shop layout, and develop the computer program. It was worth the effort and the money, they felt, because they estimated savings at \$372,900 the first year, averaging out to \$530,700 per year over the next five years. In addition, it would make maximum use of facilities and increase yield.

The critical point in the life cycle of any proposal occurs when the engineer presents his recommendation to the cost reduction committee, according to Morris Burakoff, the department chief at Merrimack Valley who is responsible for coordinating cost reduction activities there.

"First of all, the engineer has to demonstrate that he's done his homework, that he knows the answers to a whole batch of questions that might come up. Next, the committee members should have a pretty good idea of what's ahead for the product under discussion: If it is going to be replaced by something new, for example. In the end, the committee must decide if the proposal is worth the time and the money to implement."

One of the biggest cost reduction cases in Western's history is now under way. Bell Telephone Laboratories and Western have jointly developed a new kind of wire used in installing phones. It's smaller than the former wire and has a slippery insulating jacket that will reduce the time and effort needed to pull it through conduits in apartment and office buildings. Cost savings to Western Electric will amount to about \$1.4 million a year; labor savings may total \$20 million for the Bell Telephone companies.

"Take one cost reduction step at a time and introduce it smoothly, quickly and practically as possible, without insisting on the complete development of the whole idea," explains Engineer William D. Watson, left, who reviews an idea with his manufacturing counterpart in the Quartz Crystal Unit Shop.







"It's not enough to say that cost reduction is important. You've got to give credit and recognition. And if results count in evaluating performance, it is important," according to Morris F. Burakoff of WE's Merrimack Valley Works.

"Fair and equitable controls in results reporting are absolutely essential, but you can over control. The balance must be established by experiment," states William G. Seyter, manager of engineering planning at Western Electric's headquarters in New York.

"Everybody can suggest ideas," says Marvin Hill who coordinates cost reduction at Merrimack Valley. "People on the production line, as well as our outside suppliers, are encouraged to work with the engineers to hold costs down."



"If you're really after big savings, you can't be afraid to spend money," Mr. Burakoff points out. "Today, technology is so sophisticated that it costs a lot of money to put some of these ideas into effect.

"At the same time, you've got to realize that you can't win them all. You may have to spend some money to find out that you can't save what you thought you could. Or sometimes you can try something and it won't work. Try it again some other time."

The continual pursuit of cost reduction is another essential ingredient in the Western Electric program. Although the schedule for any cost reduction case includes a "close case" date, none is ever filed away.

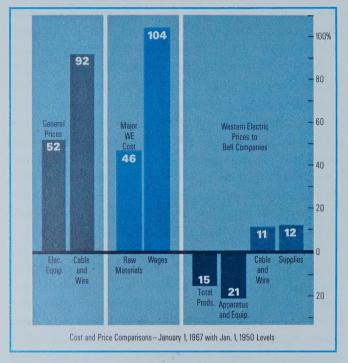
"We don't just take one shot at it, prove it in, then sit back with a contented sigh and collect the savings. You have to keep right on working with the same product, always looking for ways to improve it or cut the cost of making it," adds Marvin Hill, who helps Burakoff coordinate cost reduction efforts at Merrimack Valley.

# Motivators: achievement, recognition

In the production of one small item — deposited carbon resistors, for example — 20 separate proposals to cut costs were processed during the past five years. The cumulative savings over that time have amounted to over \$553,000.

The product and planning engineers feel the sense of achievement and the recognition they get are the biggest motivators in developing new ways of cutting costs. "Cost reduction is the only program I know of where you can go before the top management and tell them, 'Look, we can save you so much money by doing such and such.' There aren't many places in industry where this is possible. It's a great opportunity," states Leonard J. Winn, a product engineer at the Merrimack Valley Works.

"There's a lot of personal satisfaction involved when you're working on a good case. Not only do we know that our performance is being evaluated—partially, at least — on the basis of our cost reduction



effectiveness, but we also know that there is direct competition between Western manufacturing plants," Mr. Winn points out. "It's a great competitive challenge, a working test of our professional competence."

Winn and other Western Electric product engineers work against a yearly cost reduction savings goal. Each engineering department and each manufacturing location has a similar goal — as does the entire company. Fixing the target — setting the goal — starts with each enginering department which each fall presents its firm plans for cost reduction for the next year and its preliminary views of other possibilities. The department's goal, an amalgam of indi-

"Presenting a cost reduction proposal to the committee is the kind of challenge an engineer lives for," states Charles W. Higgins, left, of WE's Merrimack Valley Works. "His ideas must meet rigid standards, both technical and economic."



vidual engineers' targets, is then dovetailed into a plant goal which, in turn, is combined into a company-wide goal. This year's target: \$35 million.

Although the formalized engineering cost reduction program is the most significant, it is not the only means by which Western Electric seeks to keep the price level of its products low. The engineer's primary responsibility is planning for production at the lowest possible cost — cost avoidance — and this is the most important effort.

Like other manufacturers, Western Electric has an employee suggestion plan which has produced more than half a million suggestions since it was inaugurated in 1944. About one-quarter of these have been adopted. Result: estimated savings of \$13 million.

In addition, Western has a group wage incentive plan, which provides a bonus of 15 per cent of the basic wage rate when the work group's efficiency meets the carefully spelled-out standards. As the group's efficiency goes above or falls behind the standard, the incentive factor in their wages rises or is reduced accordingly.

Another manufacturing program is the standard cost system which sets up a yardstick — an objective — for each element of costs. Standard costs tell the first-line supervisor how much his operation should cost, thereby making it possible for him to determine whether he spent more or less than he should have for labor, materials, or other expenses under his control. It also provides a comparison of performance between work groups in any plant.

The effort goes beyond manufacturing. Western Electric's purchasing and transportation organization has a sustained program to reduce costs. The service division has been registering substantial savings in its distribution, installation and equipment engineering activities for many years.

To cite one case: a new solvent polishing process is being developed to restore telephones to their "like-new" appearance which will enable 75 per cent of the plastic parts to be reused, instead of only 45

per cent with the present buffing process. With more than 16 million telephones being restored at the 35 Western Electric distribution centers across the nation, annual savings are estimated at nearly \$2 million.

What does it all add up to? Last year, manufacturing cost reduction savings amounted to over \$30 million and, over the past decade, \$200 million.

#### Price level 15% below 1950

The result of this cost reduction effort is that today the price level of Western Electric's products is about 15 per cent below 1950 — despite increases of 104 per cent in wages and a 46 per cent increase in the cost of raw materials.

What does this mean to the Bell System operating companies and their customers? The telephone set itself serves as a good illustration. Since the present design of the standard desk telephone was introduced in 1949, 2,300 separate changes have been made to improve its performance and lower its cost. The result: a better telephone for 25 per cent less than it cost originally.

This, of course, has the effect of helping the Bell System operating companies keep their needs for new capital to the lowest possible level, makes more money available for service improvements, and — in the case of some service offerings — makes it possible to reduce rates to the telephone user.

"This achievement," Western Electric President Paul A. Gorman says, "has helped hold down the cost of telephone service to the public. It was possible chiefly because of cost reduction.

"This policy of passing on in lower prices the economies we have achieved — or will achieve — as a result of our intensive drive to cost reduction has contributed much to telephone progress. It is our membership in the Bell System that makes our pricing philosophy possible, just as it makes possible — just as it dictates — our total commitment to the goals of the Bell System as a whole."

H. I. Romnes, on February 1, became chairman of the board and chief executive officer of the American Telephone and Telegraph Company.

Here are some of the ideas and opinions he has expressed about the business in which he's worked 38 years and the society of which it is a part.

The pervasive theme of his remarks is his emphasis on quality—in service, in workmanship, and in life.

In today's complex society, he sees management's job as

# A Summons to Excellence

# What is Our business?

Our business, I'm glad to say, faces an uncertain future. Not only do electronic switching and communications satellites offer potentialities we can barely imagine now, but so does the laser with its capacity to transmit — and to store — vast amounts of information in a beam of light. So does the wave guide cable now under development by which we hope to be able to transmit a third of a million simultaneous conversations over a single "pipe." And so, too, do recent developments in Pulse Code Modulation, a system that promises as dramatic economies in short-haul transmission as the waveguide cable does for long haul. . . .

In our business the potentialities of a new technology are a long way from being "topped off." As

a matter of fact, if there is one overriding lesson in the history of the telephone, it is that growth and progress depend on a constant probing for new potentialities in communications service.

Our business was born of research and it has grown through research. . . . This is our investment in the future. . . . What its yield will be is beyond precise prediction. But I do know we have no more cherished asset than our capacity to change, to innovate.

Chamber of Commerce Baltimore, Maryland November 8, 1965

Surely we can never forget — in applying new technology to our own business practices — that the ultimate test of everything we do is the satisfaction and convenience of the customer. He is the one who shouldn't be folded, spindled or mutilated.

U. S. Independent Telephone Association New York City October 18, 1965



We number our customers in the millions. . . . But we serve them one at a time.

More and more, it seems to me, the public's opinion of the telephone company will reflect its sense of the personal interest we show in all our dealings. . . . It is because of this desire — the natural, understandable desire for personal attention—that we have made it a precept of our business that, whatever miracles automation might achieve, our customers will always have access to a real, live human being — an employee equipped and trained to be helpful.

NAWGA Convention Chicago March 7, 1966

# Managing Change

The management of change in our society is a partnership — a partnership between enterprise and innovation, between invention and investment. Each has obligations to the other — enterprise to support the quest for truth from which all new things come, to run the risk of untried ways; innovation to provide a continuously evolving practical specification for progress.

Ohio State University Conference of Engineers and Architects Columbus, Ohio April 28, 1961

... a business information system, if it is to be successful cannot be imposed — appliqued — on an organization. Indeed, were you to attempt to do so — and however elegant your design — its purported beneficiaries would almost certainly resist it. And they would be right in doing so.

To the technologist, their resistance might seem like sheer human cussedness, mankind's traditional response to any threat to his accustomed ways. But, more fundamentally, any system that does not grow out of an organization's own experience and that

does not match its own definition of its needs and the results it seeks, just can't be a very good system.

Participation isn't just a necessary precondition of acceptance; it is a prerequisite of effective design.

International Data Processing Conference Chicago, Illinois June 22, 1966

... The introduction of a business information system is so intimately bound up with a company's operations, its organization structure, the decision-making power of its managers . . . not to mention its responsiveness to its customers . . . as to require the most comprehensive management consideration.... In some organizations, the installation of a business information system has had the effect of drawing the authority for decision-making closer to the top. And in some organizations this may be all to the good. ... But in other organizations - and I would count the telephone business among them - the need to respond flexibly to the unique needs of each community, each customer, is paramount. The design of a business information system for such a company will be quite different from the company with the accent on centralization. But the need for such a system — and its value — may be no less. Its purpose, however, will be to provide the local manager the context of information he needs to make his own decisions as to how best to serve his customers.

> Industrial Communications Association Pittsburgh, Pennsylvania May 4, 1965

# The Individual's Role

First in my list of the individual's responsibilities to society is the responsibility to do his job well—assuming, of course, that the job is a useful one. Being merely adequate is not enough. Society will remain static if the standards we set for today's attainment are no higher than yesterday's and tomorrow's no

higher than today's. The "pursuit of excellence" may be an over-worked phrase. But it is the root of progress. It is something we owe not only to society but to ourselves.

> Science and Engineering Club Kearny, New Jersey June 28, 1960

... Increased mechanization in shop and office perhaps paradoxically - is actually increasing the significance of human effort. With automation the investment for which each individual employee is responsible is growing. And what he does with the complex and expensive facilities at his command is coming to have a more critical bearing on our success. The demands of the new technology are changing the composition of our work force, putting greater emphasis on individually acquired skills. ... The progress we seek cannot spring from an organization chart, however artfully designed; it can only come from people. . . . More and more it will be the man that makes the job rather than the other way around. Personal attributes - initiative, creativity, even that old-fashioned one, responsibility - will be the factors that spell the difference between success and failure in tomorrow's industry.

> Reading and Berks County Chamber of Commerce Reading, Pennsylvania June 6, 1961

# Our Society and Its Needs

Equal opportunity is a fine phrase. Making it come true is an arduous, sometimes painful process. But there are many good reasons why management needs now to demonstrate not merely good faith but practical initiative in support of this basic American tenet. The good opinion of the world is only one of them. A more compelling one is that prejudice breeds waste, the most tragic kind of waste, the waste of human resources. But in the final analysis there is one

reason above all others for giving our best management attention to making equal opportunity come true — and that is because it is right.

Chamber of Commerce Associated Industries of Arkansas Little Rock, Arkansas November 8. 1961

Today our country is attacking the twin problems of poverty and discrimination by a strange and sometimes confusing mixture of means, public and private, mandatory and voluntary, Federal and local.

This arena will be the principal testing ground of the vitality of local initiative in the months and years ahead.

I for one have no doubt about the sincerity of our country's commitment to the attack on poverty and discrimination. How long it will take I don't know. But the job will get done one way or another.

How it is done, though, can make a great deal of difference as to whether the balance of decision-making in this country swings toward Washington or swings closer to home.

Business people can have a great deal to do with the outcome.

. . . If enough trained business intelligence is focused on these problems — to help sort out the priorities, to help match objectives to resources realistically — the job is going to get done sooner and better.

Wisconsin Manufacturers Association Milwaukee, Wisconsin May 17, 1966

We [in business] need to demonstrate our concern for the larger interests of society through the application of business-trained intelligence to problems that transcend the special interests of business and affect the whole community. There are problems cut to the measure of each of us — hometown problems like schools, slums, traffic and taxes; regional problems like transportation, water resources, industrial development and the like.

... To stand aside in the face of these problems is to deny our communities their most needed resource — responsible leadership. It is with poor grace that businessmen decry the growth of big government, the centralization of power and authority in Washington, in the absence of taking up the responsibility themselves, where it belongs — at the local level. If we don't, I'm afraid we won't be able to complain that our responsibility has been taken away. We shall have given it away — and some of our freedom with it.

American Management Association New York City February 7, 1961

## **Business and Government**

... It would be unfortunate, it seems to me, if some of the more dramatic encounters of business and government should lead our people to the conclusion that there is a necessary and inevitable conflict between public and private interests.

Should this happen, the American people will have lost sight of that feature of our economy that has made it unique among the nations of the world, that has brought us further, faster than any system of economic organization yet devised and which remains our best hope for growth and progress in the future. I mean the freedom of men and organizations to strive competitively to excel and to derive appropriate rewards for achievement. It is precisely in the pursuit of private aims that we have felt the public interest to be best served.

Chamber of Commerce Winston-Salem, North Carolina May 17, 1962

# **Business and Youth**

I believe the best of youth remains today what it always has been — purposeful and idealistic, ambi-

tious to be of some service in this world. Does business provide scope for this ambition, this idealism? Career choices being made in our schools and colleges will largely turn on the answer to that question. In the face of cynicism with respect to the motives, ethics and standards of business there is no more serious charge on American management today than to convey to our young people that a career in business will challenge the best that is in the best of them.

Associated Industries of Massachusetts Boston, Massachusetts October 26, 1961

# Excellence

The potentialities of communications are enormous - and quality is the key to the future. The fastest growing aspect of communications today is not person-to-person but machine-to-machine — data transmission. Data transmission imposes vastly more stringent demands of the capabilities of communications circuits than do voice conversations. At the fantastic speeds at which data traffic will be handled thousands or even millions of bits per second — an otherwise imperceptible interruption or irregularity in transmission could lead to disastrous distortions in vital statistical information — a missed decimal point, for example. That we are today able to envision a time when data transmission may rival voice traffic is a tribute to the people in our laboratories and factories who have been able to build a new order of quality into the countless components of our communications network and thus achieve a whole new order to capability.

> IRE-EIA Meeting Toronto, Canada November 13, 1962

... it does seem to me that the standards of excellence we in business set for ourselves in this day and age must go beyond the customary measures of efficiency and convenience and profitability and take account of the human qualities on which more and more our performance will be judged.

For all day, every day, the earnestness with which we in business pursue our professed standards of high value at low price are being quietly appraised. The integrity of our business relationships, the craftsmanship of our products, the sincerity of our dedication to service — all are being tested by millions of Americans — one at a time.

On the outcome of this appraisal, not merely the prestige of business but its future freedom and vitality will depend.

NAWGA Convention Chicago, Illinois March 7, 1966

... business freedom in the sense that I am thinking about it is not the heedless exercise of self-interest. It is a freedom that must be earned. To my mind, earning it requires that we recognize that responsibility to the public interest is an explicit function of business management in our time.

That responsibility calls, first of all, for a renewed initiative in support of industry's basic obligation to the public — enhancing the economic performance of our country and enlarging the opportunities of its people. But it calls as well for a sensitivity to human needs and, in the face of the economic, social and ethical problems that have added complexity to today's management job, it calls for the added imagination to discern and the courage to do what is right. It is a challenge to the character and competence of American business. It is a summons to excellence.

Chamber of Commerce Winston-Salem, North Carolina May 17, 1962



# The Promise of Holography

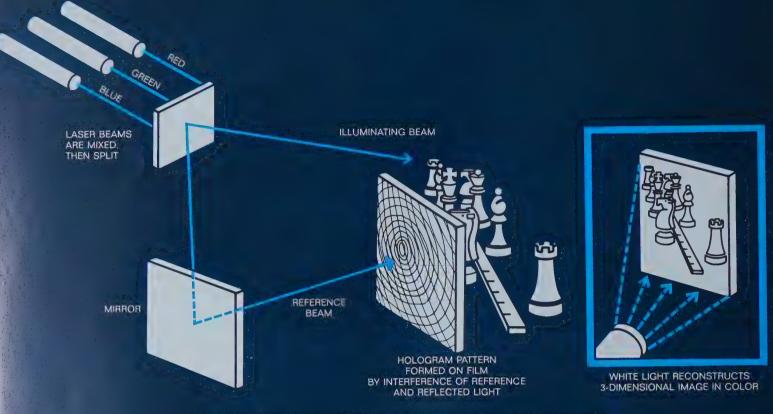
Lasers and "lensless" photography
techniques can now produce
holograms of three-dimensional,
multicolored images that "float"
in midair and may revolutionize
storage and retrieval of information

For years scientists have been groping for ways to preserve and reproduce objects in three dimensions. The best that have been produced thus far have been stereoscopic devices and cinerama motion pictures — both of which give the impression that you're seeing the object in 3-D — and cumbersome Polaroid glasses that give the effect of three dimensions.

But scientists at Bell Telephone Laboratories and the University of Michigan have developed a method by which three-dimensional, multicolored images can be seen by shining an intense beam of light on a hologram, a photographic plate or a piece of film that records an image of an object illuminated by a laser beam. The realism of a hologram is so great that the image appears to "float" in midair and is practically indistinguishable from the real object itself.

Although its ability to reproduce a three-dimensional image is one of its most important properties,

The realism of holograms is demonstrated by David Melroy of Bell Labs who holds a Trimline® Touch-Tone® telephone (right) beside a three-dimensional photographic image of the same telephone as it is illuminated on a piece of translucent film.



To make a hologram, laser beams are mixed, then split into two beams: an illuminating beam that shines directly onto the object, and a reference beam that's reflected by a mirror onto photographic film. By shining a beam of light onto the film, a three-dimensional multi-color image of the object is reproduced.



Three conventional pictures of a single hologram photographic plate demonstrate the ability of a single hologram to show three sides of a subject. When viewed against a yardstick, it is possible to see the left side of the chess figures, the head-on view, and the right side of the figures.



odd looking specks and whirls on the holographic plate (above) record the sual pattern produced by the interaction of two laser beams. When illusinated by a beam of light (below), the original subject is recreated in a three imensional image which "floats" either before or behind the hologram.



the hologram has other characteristics that make it attractive to scientists and engineers:

- A hologram does not require any lens to produce an image,
- A hologram can produce multicolored images from film emulsions which normally produce only black and white images,
- A hologram can be broken into pieces, yet each piece can still produce the entire image, and
- A single hologram can record information about many different objects.

The potential of the hologram technique is implied in its name which is derived from the Greek roots holo, meaning "whole," and gram, meaning "writing" or "record." A hologram's capability of storing large volumes of information in a compact area may make it a particularly valuable element in the Bell System's nationwide communications network. For example, Bell Labs scientists are investigating the possibility of applying holography techniques to the storage and retrieval of information for switching, information services, and the transmission of large volumes of visual information.

How is a hologram made? One way to answer this question is to compare how an ordinary photograph is made with the means of making holograms.

When taking a conventional picture, the subject is usually illuminated by sunlight or light from a lamp. An image of the subject is formed by a lens focused on photosensitive film that records the image by responding to the intensity of light reflected from the subject. A black and white photograph, therefore, is made up of black, gray and white tones that correspond to variations in brightness of the subject.

Holography, however, differs in two basic ways: (1) no lens or image-forming device is needed because no focused image is formed on the hologram, and (2) the object must be illuminated by "coherent" light, such as that provided by a laser. The use of coherent light enables special patterns of light waves to be recorded on the film, in addition to variations



Bell Laboratories' Larry H. Lin (left) and Ken Poole make the multicolored hologram which is seen on the preceding page.

in brightness. (Coherent light, which contains light waves of nearly a single wavelength, provides a scale for measuring the distance the light has traveled and the direction from which it came.)

A hologram records a visual pattern produced by the interaction of two coherent light waves from the laser: one that is used to illuminate the holographic plate, and the other to illuminate the subject. Light waves that illuminate the subject reflect back to the plate and interact with the first light wave on the hologram. This interaction of light waves produces a combination of lines, specks and whirls which may look like an out-of-focus fingerprint or a smudged or darkened photo negative.

When this combination of smudges is illuminated — either by another laser beam or a beam of light from the sun or a flashlight — the original subject will appear in three dimensions, apparently floating in midair. And if different colors of laser light are used to illuminate the subject, a multicolored hologram will be produced.

The basic principles behind holograms were first described in 1948 by Dennis Gabor of the Imperial College of Science and Technology in London. For many years thereafter, no practical source of coherent light was available and work in holography was limited. In 1960, however, the advent of the first laser sparked renewed interest in holograms. This interest was stimulated mainly by experiments of scientists at the University of Michigan's Institute of Science and Technology.

About two and one-half years ago, Bell Labs scientists at Murray Hill, N. J., recognized holography's capacity to store vast amounts of data on small slides. In 1965, two BTL scientists discovered a way of making two-color hologram images by laser light, and a year ago, members of the electron tube and optic device department teamed up with University of Michigan scientists to create two-color holograms that could be viewed with the light of a high-intensity lamp rather than a laser.

Studies now under way are investigating the possibility of using holograms to make more precise masks for microminiature integrated circuits. Other research work is under way to see if television and Picturephone® systems can transmit three-dimensional images.

But to make a hologram today is a formidable task. To produce the holograms pictured here required three days to align the optical components, five beam splitters, five lenses, 13 mirrors, the hologram plate and subject, and a laser atop a three-ton table designed to avoid shock. (If the object moved as much as two ten-millionths of an inch, the variations would have shown on the hologram and distorted it.)

Whatever its potential may be, holography is now about at the same stage of development as photography was about 130 years ago when Louis Jacques Mande Daguerre, a French artist, exhibited a picture of some small busts, a basket and a painting. Yet the promise of holography may be as great as Daguerre's primitive photographic efforts.

# The Interstate Rate Case

AT&T's proposed findings emphasize the need for rate of return in the area of 8%

AT&T submitted its proposed findings and conclusions and legal briefs for Phase One of the interstate rate case to the Federal Communications Commission in late March.

In a letter of transmittal, AT&T Vice President F. Mark Garlinghouse reemphasized the need for Bell System earnings "comparable with those of other companies offering competing investment opportunities" so that continuously improving, low-cost communications service may be provided. "By this criterion, our evidence shows," the letter stated, "the Bell System needs a return averaging at least 80/0 on the total investment in its interstate business."

The letter also dealt with rate of return and three related issues covered in the initial phase of the rate case: accelerated depreciation, rate base items, and separations procedures. "On each of these questions," Mr. Garlinghouse said, "our position reflects the basic responsibilities of our businesss: providing the public an ever-improving, low-cost communications service and maintaining the financial strength and integrity necessary to fulfill that objective in the years ahead."

Following is the text of Mr. Garlinghouse's letter:

#### Rate of return

We believe that to provide excellent and continuously improving communications service at low cost, the Bell System must produce earnings on its share owners' investment that are comparable with those of other companies offering competing investment opportunities. By this criterion, our evidence shows, the Bell System needs a return averaging at least 8% on the total investment in its interstate busi-

This need is shown by the testimony of our principal financial officers, experienced in raising the huge amounts of capital necessary to meet the public's need for our services, and it is firmly supported by highly qualified witnesses from the financial community, as well as by leading economists and outstanding university scholars.

In the course of our presentation, Ben S. Gilmer, president (then executive vice president) of AT&T, defined the basic objective of our business as an "ever-improving service" and stressed the importance of continuing technological innovation as the means to that end. But, he pointed out, realizing our full potential for better service through innovation depends on the opportunity to achieve good earnings.

"Earnings prospects that encourage a commitment to the future," Mr. Gilmer said, "will help assure continued leadership in the technology of common carrier communication." (Bell Ex. 31, p. 7)

In the view of distinguished economists appearing in our behalf, determination of an appropriate rate of return for our business must give full account to the role of communications as a critical determinant of the nation's ability to meet its economic goals. A minimum rate of return aimed at saving a small fraction of the public's telephone bill would stultify growth and innovation, retard the economies that derive from technological advance and thereby frustrate the public's larger interest over the

<sup>1</sup>Mr. Scanlon's conclusions were corroborated by independent studies prepared by Dr. Walter A. Morton, Professor of Economics and a noted lecturer and author in the field of public utility economics, and by Dr. Irwin Friend, Professor of Economics and Finance, The Wharton School of the University of Pennsylvania.

<sup>2</sup>The five were: F. J. McDiarmid, Vice President of Lincoln National Life Insurance Company; Charles W. Buek, President, United States Trust Company; Gustave L. Levy, Chairman of The Management Committee, Goldman, Sachs & Co., Vice Chairman of The Board of Governors, New York Stock Exchange; John H. Moller; Senior Vice President, Merrill Lynch, Pierce, Fenner & Smith, Adrian M. Massie, former Chairman, Trust Committee of Chemical Bank New York Trust Company.

long term. In short, it would be false economy.

As pointed out by AT&T's vice president and treasurer, John J. Scanlon (Bell Ex. 20), the plain fact is that an investor will not buy AT&T stock if he thinks he can get better performance in another stock, relative risk to his investment considered. And, in assessing risk, the investor does not view the stock of AT&T much differently than he does the stock of other large, well-established American businesses. Thus, if AT&T is not earning a return on its equity in a range comparable to the earnings of other companies, the investor will choose some other investment opportunity.

In order to ascertain the earnings level needed to maintain AT&T stock as a comparable investment alternative. Mr. Scanlon analyzed the earnings on equity of 528 manufacturing companies. The study showed that equity earnings of these companies manifested strong central tendencies of about 10% to 12%. The averages for all companies were even higher. As a futher check, Mr. Scanlon made a similar study of the equity earnings of 128 electric utility companies and found their equity earnings to be reasonably comparable to non-regulated companies. Any differences in business risk between manufacturing companies, telephone companies and electric utilities tended to be equalized by differences in capital structure between the respective industries, so that the investment risk of the equity owner in each case was quite comparable. Finally, in order to allow for possible residual differences of equity risk, Mr. Scanlon said that Bell should be allowed to earn between 10% and 11% on its equity – the lower end of the central range of manufacturing earnings.1

To demonstrate the practical signifi-

cance of the comparable earnings standard, Bell introduced five prominent spokesmen representing all sectors of the financial community who described the manner in which AT&T stock is actually evaluated as an investment opportunity.<sup>2</sup> All of their analyses supported the same result—that AT&T needs a return of 10% to 11% on book equity to be competitive with other investments. This evidence was never challenged. This level of earnings for equity translates to an over-all fair rate of return of at least 8%.

Finally, our need for earnings of at least 8% was examined from the point of view of national economic and defense objectives and desirable regulatory goals. This testimony was presented by men of such stature and reputation that all have been valued advisers to Presidents of the United States. They gave unqualified support to the position that earnings of at least 8% for the Bell System would serve the national interest and be consistent with national policy.

Despite a clear challenge to do so,<sup>4</sup> no witness with practical financial experience came forward to oppose these views. In point of fact, only three witnesses made rate of return recommendations inconsistent with our own and none of the three had any investment or financial experience.

One of the opposition witnesses (Robertson, W. Va. Ex. 1) derived a cost of capital of 7% by using raw earnings-price ratios, a method thoroughly repudiated by the other witnesses, by numerous commissions, and by NARUC. Dr. Robertson admitted that his cost of capital, so derived, could not be applied to the book value of AT&T stock (Tr. 5072). Hence it is useless in this case.

Another opposition witness (Thatcher, FCC Staff Ex. 16) recom-

<sup>&</sup>lt;sup>a</sup>These witnesses were: Robert R. Nathan, Alexander Sachs, Paul A. McCracken, and Robert A. Lovett.

<sup>&</sup>lt;sup>4</sup>Mr. Scanlon said: "Doubtless the Commission will hear other evidence as to the rate of return required by the Bell System — some with conclusions differing from those proposed by AT&T. It is to be hoped that the Commission will insist that such testimony be similarly buttressed by the testimony of witnesses of comparable investment competence, stature and responsibility to those presented by the Company." (Bell Ex. 20, p. 68).

mended a return of about 7%. But he conceded many errors, some minor but some major. He made no allowance for flotation costs but admitted the he should have done so. He did not give effect to rights offerings and vacillated on whether he should have, although the other staff witness, Dr. Gordon, was clear that the value of rights must be considered in finding cost of capital. Clearly, Dr. Thatcher's testimony lacks credibility, and if his figures are adjusted for his errors, his rate of return would be at least 8%.

The third opposition witness (Gordon, FCC Staff Ex. 17, p. 23) stated flatly that, if the Commission accepts the existing capital structure and rate of new investment, then the Commission should allow AT&T a rate of return of 8.25%. He then argued that the Bell System's financial policies could be drastically altered to reduce its cost of capital.

Dr. Gordon presented a complex mathematical model which included a formula designed to predict the price of AT&T stock under various assumed investment, financing and earnings rates. His formula does not of itself produce a cost of capital; it merely produces a market price. Using this formula, he calculates what the market price would be at different rates of return and different rates of growth. He then selects as the cost of capital the lowest rate of return which would, granting his assumptions, produce a maximum market price at the desired rate of growth. He computed that, at a 7% rate of return and with a \$2 for \$1 debt-equity financing policy, AT&T stock would reach a maximum price of \$73.76 if management invested at the 8% growth rate he assumed to be proper. It was his contention that any higher or lower growth rate would result in a lower

stock price. He admitted that the validity of his model — and his conclusions — depended on whether the model produced a maximum price of the stock. His assumptions, that the Bell System could prudently carry its debt ratio to 50% and that the market could absorb at reasonable cost the volume of new debt required by his policy, were the products not of his model but of his unsupported judgments in an area where he claims no expertise.

As it turned out, Dr. Gordon's model did not produce a maximum price of the stock. Accordingly, by his own admission it cannot be used to determine the cost of capital.<sup>6</sup>

On February 1, two weeks before the record was closed in this phase of the case, Dr. Gordon came in with a new model, based on new and questionable assumptions and even more heavily reliant on his unsupported judgments. His new model still had many infirmities, and it indicated a return requirement of 7.44% (Tr. 9935-36), which he "adjusted" to 7.25%.

Even though one might speculate on whether future mathematical models could be helpful to rate of return determination, at this time and on this record Dr. Gordon's approach — with the collapse of his first model and the numerous deficiencies in his second — can hardly be regarded as a serious substitute for the expert testimony of the witnesses presented by the Bell System. In short, Dr. Gordon's models simply cannot be relied upon in this case.

Finally, it should be noted that Dr. Gordon readily conceded that if Bell's present financial policies are "within the limits of prudence of sound financial management," AT&T should be allowed to earn more than 8% (FCC Staff, Ex. 17, p. 23; Tr. 9840).

Thus there is no real issue on rate

<sup>5</sup>Dr. Thatcher frankly conceded he had erred in failing to consider the value of stock rights in computing his cost of equity capital (Tr. 4711), an error which, when adjustment is made, would bring his cost of equity to the same level as that recommended by Bell witness Friend (Bell Ex. 18). In a later appearance, Dr. Thatcher retracted his confession of error (FCC Staff Ex. 30), but he could not explain his retraction and finally demonstrated his lack of understanding by asking Bell Counsel to explain how stock rights should be considered (Tr. 9603).

°Dr. Gordon said: "If price rises indefinitely with the investment rate as portrayed in the graph on page 5503, my analysis does not yield a cost of capital figure for AT&T." (FCC Staff Ex. 17A, p. 9) Later he said: "I agree that the estimating technique Dr. Tukey (Bell's witness) proposed is more accurate than my simpler method, and therefore, as my model stands, share price does rise indefinitely with the investment rate for a 7°/o rate of return." (FCC Staff Ex. 35, p. 8). Thus, his mathematical error means that by his own statement his model cannot be used to find the cost of capital.

7It is important to note that there is not before the Commission for decision at this time any other question regarding accelerated depreciation such as whether a portion of Bell's tax expense should be disallowed (a) directly on the assumption Bell should have taken accelerated depreciation, or (b) indirectly on the grounds that Bell's earnings should be assumed to be higher than they are because

potential tax deferrals resulting from accel-

erated depreciation should be assumed to

"flow through" to net income.

of return; the record will not support a finding lower than 8%. The only remaining question relates to the prudence of the Bell System's financial policy of maintaining debt ratio in the 30% to 40% range.

The reasons for Bell's policies regarding debt ratio were fully developed in the record. Mr. Scanlon testified that the development of the Bell System's capital structure has been the result of careful and informed attention to the capital market month by month and year by year. Clearly the record demonstrates that Bell's financial policies were developed over the years by an informed, responsible management and that these policies are powerfully supported by the competent testimony of leaders in the financial world.

#### Accelerated depreciation

Since the issue in this phase of the case is limited to the relevance of accelerated depreciation to rate of return,<sup>7</sup> our brief places emphasis upon demonstrating that no adjustment in Bell's allowed rate of return is warranted by reason of Bell's non-use of accelerated depreciation.

The Bell System's decision not to use accelerated depreciation was reached after careful consideration by Bell's officers and directors (see Stott, Bell Ex. 38 and Jones, Bell Ex. 37), who consider it prudent for the Bell System companies to use straight-line depreciation for tax purposes, as they must for book purposes. In practical effect, the only choice Respondents have is between straight-line tax depreciation and accelerated tax depreciation with "flow through" of the reductions in tax payments. The position of the opposition witnesses is based on setting rates as if Bell had adopted accelerated tax depreciation with "flow through."

"Flow through" is a step back toward the concept of retirement accounting. It ignores a current cost just as retirement accounting ignored a current cost. Years ago, it was asserted under retirement accounting that depreciation reserves need not be accrued, because, with continued plant growth, retirement charges would never exceed accruals and the large reserves created by accruing full depreciation would be unnecessary. This concept is now universally discredited, and it should not be permitted to make its partial reappearance under the form of tax "flow through."

As Mr. A. L. Stott, AT&T vice president and comptroller, pointed out, depreciation deductions for tax purposes arise out of the investment of capital by investors. The theory of the opposition witnesses would involve eroding the value of the investment by prematurely taking tax deductions attaching to the property without recognition of the cost involved.

Even if we were to assume that this Commission might have a different viewpoint about accelerated depreciation, it would be impossible on this record to find that the Bell System's non-use of accelerated depreciation is the result of Bell management's imprudence.8

In support of our position that no adjustment in Bell's allowed rate of return is warranted by reason of Bell's non-use of accelerated depreciation, we show that the use of accelerated depreciation could not provide a source of interest-free capital, thereby reducing the amount of capital which Bell must raise in the future, because, for very practical reasons, Bell could not "normalize" the tax deferrals resulting from accelerated depreciation. Without "normalization," there would be no fund or reserve available

One of the opposition witnesses who strongly urged "flow through," agreed that whether a company should or should not use accelerated depreciation is a question on which reasonable men could differ (Van Scoyoc, Tr. 9313A).

for investment in telephone plant.

Hence, the fact that tax deferrals resulting from accelerated depreciation with reserve accounting can provide some businesses with funds which can be used to promote national economic growth can not in any way affect Bell's required rate of return.

No witness in this case has said that Bell's rate of return should be adjusted because of Bell's non-use of accelerated depreciation. And, of course, no witness has said how much any such adjustment should be.

The Commission staff urged that the issue of accelerated depreciation be included in Phase 1 to the limited extent of its relevance to rate of return. So it may well be that the staff will present, ex parte, some other argument on this point which has not occurred to Respondents. If this should happen, we believe due process requires that we be informed of the staff's argument and be given an opportunity to meet it or to rebut it.

#### The rate base items

No party to this case questions that Bell must have cash with which to do business, that it must have on hand material and supplies, and that to meet the public's requirements it must always have substantial amounts of plant under construction. And as to material and supplies and plant under construction, we can find no challenge in the record as to the reasonableness of the amounts Bell had on hand during 1965 or 1966.

What then are the issues? As we see it, the principal questions to be resolved are these:

(a) Have all the amounts claimed by Bell for these three rate base items been supplied by the investors?

Our testimony has amply demonstrated that the amounts claimed in

the rate base have all been supplied by investors and that all amounts not supplied by investors have been excluded. Two separate studies (Wentworth, Bell Ex. 3 and Mason, Bell Ex. 33) supported this testimony. The validity of these analyses was not seriously challenged in this record.

(b) Is the amount of cash held by Bell and claimed in the rate base reasonable?

Succinctly, Bell's policy is this: For prudent management, enough cash should be held on hand so that the total of Bell's current assets (consisting mainly of cash, material and supplies, and accounts receivable) should be at least equal to its current liabilities. The reasonableness of this one to one ratio was supported by evidence showing the practices in other businesses (O'Connor, Bell Ex. 32), most of which maintain ratios substantially higher than one to one.

The reasonableness of Bell's position was further supported by a thorough explanation of the importance of maintaining at all times adequate liquid assets to cover fully Bell's tax liabilities. The legal hazards of pursuing any different course were spelled out in an opinion of the Davis Polk law firm of New York (Bell Ex. 43, Att. A).

(c) Should plant under construction be disallowed because either (1) the plant is not yet revenue producing, or (2) the investors are not entitled to a full rate of return of 8% inasmuch as Bell capitalizes interest during construction at 5%?

The allowance of the amount claimed for plant under construction is required in fairness and equity. Investors have put up the money. It is being used prudently to build new plant for expansion and modernization. And investors don't accept a lower return while plant is being built.

Actually, most of the cash is placed in temporary short-term investments until needed in the business, and the interest received is credited to revenues, thereby reducing the revenue requirements to be obtained from customers. Central investment of these funds results in the best economies and efficiencies.

<sup>10</sup>In response to a question about future risks from Commissioner Cox, Robert A. Lovett, noted banker and former Secretary of Defense, said: "I am not saying, sir, that it is my view that the future is dark. I am only saying in a company that is so fully charged with the national interest and with national security, the rule there should be to hope for the best while you prepare for the worst. That is my position. I think you have to be more prudent in this than in almost any other business." (Tr. 7952).

To disallow plant under construction is the equivalent of saying to the investor "we will not in fact allow you the full rate of return we have otherwise found reasonable." In short, the financial facts of life require that investors be paid a full return on their investment regardless of whether regulatory authorities exclude a portion of that investment.

The suggestion that the investor is entitled to no more than the interest capitalized during construction is superficial. This Commission has allowed Western Union a full return on plant under construction where no interest was charged during construction. (34 F.C.C. 217, 285-286). If investors in Western Union are entitled to a full return on plant under construction, then investors in AT&T are likewise entitled to a full return.

Since the 5 percent interest charged construction is credited to income, the effect of Bell's request is that it be allowed to earn the difference between 5 percent interest charged construction and a full 8 percent return on the amount of investors' money devoted to construction. Fairness supports the request.

# Financial risk and management discretion

It will be noted with respect to three of the major issues — rate of return, accelerated depreciation, and the rate base items — that a recurrent theme in the differences between Bell's witnesses and the opposition witnesses pertains to the degree of financial risk which the Bell System should assume. As we see it the opposition witnesses are saying this:

(a) Bell should go further into debt; your policy of 30% to 40% is too conservative; you should go to a 50% debt ratio, or even higher, and if you did, somehow or other you could get

along with a lower rate of return.

(b) Bell should take accelerated depreciation and "flow through" the tax deferrals to net income; the deferred tax liability probably will never have to be paid because future tax deferrals will be there to offset the liabilities; so again you are too conservative.

(c) Bell is too conservative in keeping more cash on hand than it needs; if you kept less cash, your rate base would be less.

This central theme, which runs through the opposition approach in this case, adds up to an advocacy of financial brinkmanship not in keeping with the longer term basic goals of both this Commission and the Bell System: to assure the nation an adequate and ever improving communications system. Neither the Commission nor management should countenance financial shortcuts which could in the long run frustrate these goals.

No one can know with certainty today whether Bell's future ability to serve would in fact be impaired by assuming the greater risks recommended by the opposition. So the question of how much financial risk should be assumed today obviously becomes a matter of judgment. But whose judgment?

Clearly, management must make the first judgment. The Commission has a right and duty to review that judgment. But the Commission should not and legally it cannot substitute its judgment for that of management unless the record shows that management has abused its discretion or has been imprudent. On this record such a finding could not be made.

Even if this Commission felt strongly that Bell should assume greater risks, it should be hesitant to force such risks on management. (See testimony of Lovett, Bell Ex. 44.)<sup>10</sup> Regulatory history is full of examples of utilities

<sup>&</sup>quot;In its report following the long investigation of the late 1930's, this Commission commented favorably on the Bell System's conservative debt ratio in contrast to certain other public utility systems having a much higher ratio of fixed income securities. (Report of Telephone Investigation, H.R. Doc. No. 340, 76th Cong., 1st Sess., 449-50, 593 (1939).)

which have failed because they assumed too much financial risk. Legislative bodies have granted commissions wide powers to prevent utilities from incurring financial risks that might jeopardize their ability to serve. It would be ironic for regulatory authority over rates to be used to force upon a utility management the assumption of greater risks than the management thought wise.<sup>11</sup>

#### **Separations**

A separate brief submitted herewith by Respondents fully discusses this complex and technical issue. In summary, there are before the Commission three principal recommendations: those of Bell, of NARUC, and of USITA. The recommendations relate to two classes of plant: Interexchange circuit plant and subscriber plant (subscriber lines and station equipment).

With respect to interexchange circuit plant, Bell recommends discontinuance of the so-called Modified Phoenix Plan, first adopted in 1956. NARUC, although with dissenting members, favors retention of the plan. Elimination of Modified Phoenix, together with elimination of certain other averaging techniques, would transfer from interstate to intrastate about \$176,000,000 of revenue requirements. In other words, if this were the only change, Bell's interstate return would be increased.

Modified Phoenix involves a process of averaging the investment and related expenses of Long Lines interexchange circuits with those of the associated Bell companies. Since Long Lines circuits are of greater average length, and since longer circuits generally have a lower investment per mile than shorter circuits, lower unit costs are assigned to Associated Company circuits than in fact apply. Thus, Modified Phoenix results in increasing

the investment assigned to interstate circuits and decreasing the investment assigned to intrastate circuits.

Since many of the circuits thus averaged could be directly assigned to interstate or intrastate, the averaging process tends to do violence to the principle of use, which should govern all separations procedures. While this weakness has always been inherent to a degree in the Modified Phoenix Plan, the problem has grown worse in recent years because of technological developments and rapid growth. We believe that long term soundness of the separations procedures calls for elimination of Modified Phoenix.

With respect to subscriber plant, the present separations procedures recognize that the worth - or value of its use for long distance interstate calls is greater than the worth of its use for short haul intrastate toll or local calls and that, accordingly, in determining how much of the subscriber plant should be assigned to interstate, the greater value of this interstate use should be recognized. The new plan proposed by Bell and supported by NARUC would provide a more accurate, and we believe more reasonable, measure of that worth component.

The effect of Bell's subscriber plant proposal would be to transfer from intrastate to interstate about \$282,-000,000 of revenue requirements. Considered together with elimination of Modified Phoenix, the effect of the total Bell proposal would be to transfer from intrastate to interstate a net amount of about \$106,000,000 in revenue requirements. This would decrease interstate rate of return by about 0.65 percent.

We believe NARUC's proposal to change only the subscriber plant methods is not only unsound in that it fails to eliminate Modified Phoenix, but is clearly impractical under present circumstances. NARUC's proposal would transfer from intrastate to interstate about \$282,000,000 of annual revenue requirements. This would necessitate a substantial increase in Bell's interstate rates.

USITA's proposals would require an even greater increase in interstate rates because they would transfer from intrastate to interstate about \$525,000,000 of revenue requirements. Western Union's proposals would transfer nearly \$500,000,000 of revenue requirements.

Under either the Bell or the USITA exchange plan the independent telephone companies would receive additional amounts in settlements with the Bell companies (assuming settlements with the independents follow the separations procedures). Under Bell's plan about \$30,000,000 would go to the independent companies leaving \$76,000,000 which would be subtracted from Bell's intrastate revenue requirements. Under the USITA exchange plan, however, about \$71,000,000 would go to the independent companies.

We believe that the Bell System's plan is sounder in principle than any of the other proposals. We recommend that it be accepted and applied uniformly in all jurisdictions.

#### Conclusion

It should be noted, as our brief points out, that for the year 1966, our return on net investment for interstate service was 8.19 percent, as recorded, and 8.01 percent, as adjusted for known changes. These results are within the reasonable range of earnings supported by the evidence.

This letter has of necessity dealt only with the high points of our case. We urge a full and careful reading of our briefs and proposed findings.

# The All-Purpose Picture Network

Behind every TV tube is an army of actors, directors, writers, sponsors, athletes, cameramen, and technicians practicing disciplines ranging from hairstyling to acoustical engineering. The efforts of these specialists produce the pictures that the TV cameras capture. Moving this output of images all over America is, however, the job of an almost equally large and diverse crew: The men who plan and man the Bell System's nationwide transmission network.



Behind men who manage TV transmission system is map of nationwide network that can be custom-tailored to each broadcaster's minute-by-minute requirement. At New York switching center (right) technicians monitor picture quality. Similar centers hum in Atlanta, Chicago, Los Angeles.



# The All-Purpose Picture Network

"Go out in the street and ask ten people what it takes to put one of those pictures on their TV tube. They think you point the camera and, bang, they get the picture. Nobody realizes what it takes to keep that flow of pictures coming in. Of course, if we do our job right, maybe we *should* be the invisible men."

Dick Kerr pauses. He's a wiry Missourian who was operations manager of an independent telephone company before he was old enough to vote. Later he ran a Signal Corps station in the Army. Now he heads a team of salesmen handling fast-breaking demands for TV transmission facilities. His bailiwick includes specialized TV networks and miscellaneous closed-circuit and educational television transmission requests that come into the New York office of AT&T's Long Lines Department. Also in this office are the men who handle requests for transmission from NBC, CBS and ABC — plus the vital 'facilities' organization that keeps an up-to-the-minute inventory of all TV transmission channels and designs networks to customers' specifications.

"How about the State of the Union message in January?" asks Dick Vitzthum, an account manager on Dick Kerr's staff who was handling the National Educational Television account. "I was sitting at home on Saturday afternoon when I heard that the President would give the talk on Tuesday. I told my wife, 'Sweetheart, I'll see you when it's over,' and headed for the office. Saturday afternoon we got the plant and engineering men together. Sunday we made the plan. Monday, the facilities people scoured the country for available circuits, which wasn't easy because everybody and his uncle wanted to transmit that event. We handled NETV's requirement to broadcast the program to 70 stations. Then, we tied in 10 live locations all over the U.S. after the speech so experts, such as Arthur Schlesinger and Walter Heller, could analyze the President's message. We bounced from one speaker to another, back and forth.

"But it worked. The Times complimented us when it reviewed the show." Vitzthum shows a clipping

from Jack Gould's column in The New York Times of January 11: "'... President Johnson's... was the first State of the Union message to be carried live on four national television networks.... The switching of the program from city to city ran off faultlessly, a testament to the technical efficiency of the American Telephone and Telegraph Company..."

Bill Cook, who handles NBC for Long Lines, breaks in. "The way Vitzthum here has been showing that dog-eared clipping around, you'd think he just got a rave review for a great perfomance in Hamlet."

## Behind the picture: planning, purpose

The Long Lines network managers, and most of the other people associated with TV transmission, live in a climate of crisis. In return for being at the mercy of events, they have the satisfaction of being part of those events. Whether it's a tragedy at Cape Kennedy or a Pope's visit to New York City, they must find a way to get the picture from its point of origin to television stations across the country. Putting the Bell System's TV switching network to real-time, on-line use takes the efforts of craftsmen, engineers and planners. While craftsmen and engineers may often be caught in the hectic "right-now" atmosphere, planners have a different perspective.

"Here's something that may surprise you: From our point of view, there are no networks as such," says Jim Griffin, who has the job of planning future TV transmission facilities.

"Physically, there's just one nationwide network: that of the Bell System. Imagine a map of the United States with an enormous spider web spun across it. This web is our network. Into it we can weave any broadcaster's geographical coverage.

"Take a typical Sunday during the football season, for example. One minute CBS has circuitry taking an NFL game all over the country. At an appointed instant in time, we dissolve that hookup into 23 regional pieces, so local stations can show local or regional commercials: snow tires in Maine, swimsuits

in southern California, budget air fares in New York. Sixty seconds later, we put the whole thing back together and the game goes on. To me, the whole transmission system is a kind of harpsichord on which we can play anybody's favorite tune."

Leaning forward and folding his big hands before him on the desk, Jim says, "We've got to have the capacity. Who else could be expected to have 600,000

CLARKS KINCE IF SWITCH

channel miles of communications circuits: 350,000 miles of voice and data channels; 125,000 miles of TV-carrying capacity; and another 125,000 miles of protection' channels, also TV-grade."

## Protection circuits provide reliability

The idea of protection capacity is expanded by Bob Miller, who helps manage the big Long Lines switching center at 32 Avenue of the Americas. Here, and at similar locations in Atlanta, Chicago and Los Angeles, the actual switches are thrown that make and dissolve the national TV circuits.

"The word 'protection' means what it says," Miller says, his voice hardening a little with recollected emergencies. "We need reliability in the face of floods, hurricanes — even rockslides on the mountains where our microwave towers sit."

Miles McCosker, who works on Miller's staff — around the clock when necessary — adds, "We also use the protection capacity to meet big demands like those football Sundays. In addition to CBS, NBC televises the whole American Football League. And either one of them may want to televise several games of regional interest, which means we create subnetworks and then split them into those separate commercial segments. Meanwhile, all the non-football stations want, deserve and get business as usual."

Bob Miller cuts in. "Of course, there's one other side to protection, just to finish the story. A nation-wide one-minute commercial in, say, the Packers-Colts game costs about \$70,000 a minute. Put yourself in the place of a TV vice president if one of our men in the sales group had to go to him and say we lost his commercial. That's another reason why, if one path is blocked, we've got to have another way to go, even if it means sending the picture from New York to Washington by way of Chicago.

"The network we have - with its 'protection'

This switch determines route TV image will take. Behind it lies miles of microwave circuitry, including unmanned towers that change picture's path at buttons' bidding.





"Now, live, from Los Angeles, we bring you..."

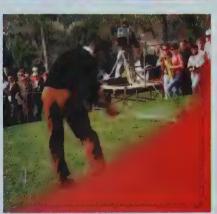
Los Angeles Open golf championship is typical of year-round right-now sports action expected by U. S. TV viewers. Commercial TV network's cameras record event, pipe pictures to its truck. Then telephone company mobile unit beams it to nearest switching center, thence to local stations around country.













capacity — makes it possible for us do just about anything a broadcaster wants. We can take an alternate route when there's trouble, meet suddenly quintupled demands, and always go by the most economical path under the given circumstances. This is the base that is built on when Jim Griffin and his people plan future growth — both for the interstate hookups that we handle at Long Lines, and the local facilities built and maintained by the Bell System operating companies."

# Local phone companies essential

Local Bell System companies generally pick up the picture at the scene of the action and transmit it to the Long Lines Department for national distribution. The New York Telephone Company, for example, lined the Pope's route from John F. Kennedy Airport to Manhattan with portable microwave towers to keep the Pontiff in constant view. "Once in the city," Dick Vitzthum recalls, "The New York Tel people put the pictures into the coaxial cables they maintain all over the city. They cover the big hotels, the United Nations — everywhere the action is likely to be. Of course, this means keeping all the channels tested and ready, even when there is no action."

On the average, the Long Lines office in New York handles 300 orders a day and, when President Kennedy was assassinated, a record 1200 were handled. Pooling their reminiscences, the Long Lines account managers agree that a week in September, 1966 was typical of the way orders for service sometimes pile up even under "normal" circumstances. All the national TV networks were doing business as usual. And then there were a few specials: A space shot from Cape Kennedy; a closed-circuit show from Detroit that permitted Chrysler's Dodge division to unveil a new line of trucks to dealers in a few dozen cities; a New York State network for two political conventions; educational hookups in a number of towns; a special closed-circuit system for Republican fund-raising dinners; and on Saturday night, Miss America "live" from Atlantic City competing with a special pro football game.

"The trend is obvious," Dick Kerr concludes. "Besides all the network shows originating in studios and on film, which will continue, the big growth areas are closed-circuit TV, educational TV, and more and direct telecasts from remote locations."

#### From systems, social implications

A man who agrees with these estimates is Dick James, engineering manager—video, at AT&T's head-quarters. On the subject of remote TV pickups, James notes that it's expensive to engineer a system that can transmit a picture from anywhere at any time. "Take the Pope's visit. To engineer a system that could handle that peculiar demand, you'd be committing facilities to an event that has occurred once in 1,967 years.

"Of course, we handle part of this demand with temporary and mobile facilities. But there's a constant demand for more of these. Probably nobody but the Bell System could be expected — or could afford — to maintain an instant capability to meet almost any unforeseen demand for transmission facilities. We accept that obligation and it is expected of us. The costs of this, though, are enormous.

"We have to have coaxial cable all over New York City — just to be ready for the occasional Pope's visit, or the visit of a head of state to the UN, or a tickertape parade, or a political rally of national interest.

"In Washington this situation is even clearer. We have to maintain 'plug-in' facilities for TV transmission all along Pennsylvania Avenue. Every four years, at inauguration time, the demand for facilities peaks. Except for an occasional parade or other public event, this 'buried plant' doesn't get much use.

"This 'standby capacity' — including all the cables and mobile units and so on — means that a substantial part of the plant is used only sporadically by the broadcasters. This is one reason we are constantly looking for opportunities to use our plant in other branches of the television industry."

Leaning back in his chair, James folds his hands behind his head and swivels toward a window that overlooks downtown Manhattan. After a pause, he outlines the broader perspective: "There are really four television businesses we're involved in, and as you go down the list the social, political, technical and personal implications grow greater.

"First there is network television, which is a oneway street — one link between an event and the station. Very precise engineering required, but the words and pictures all go in one direction . . .

"Then there's CATV, community antenna television. As a common carrier, we lease lines to the CATV people to transmit pictures from their receiving stations into the homes of their subscribers, or they use our poles for their own lines. This demand could really grow — when and if the legal disputes among CATV people, broadcasters and regulatory commissions are settled. We have to be ready with plans and equipment. Meantime, it's a very fluid situation.

"Next there's CCTV, closed-circuit television. This is the third TV business where we provide service. It's growing fast, both in number of installations and in the size of them. Xerox, for instance, just recently asked us to set up a New York-to-Los Angeles transmission link for an exclusive corporate press conference in the two cities. IBM has also been a leader in this area and we ourselves are using television to an increasing extent for conferences, instruction, etc.

"Examples of closed-circuit TV could be multiplied, and the list of companies using these facilities







Beginning at remote pickup point, Bell technicians monitor signals. New device (above) shows each switching center quality of signal received, pinpoints trouble fast.

gets longer every day. Each of their 'networks' is small compared to CBS, NBC or ABC, but there are hundreds of them — hundreds of additional networks stitched into our system, each one subject to change. 'Take out this meeting room in Atlanta. Add suchand-such hotel ballroom in Denver for next Tuesday's new product introduction.'

## ETV: biggest growth potential

"This is a growth business, an enormous one, but even this is overshadowed by number four: educational television. Here's where the technical requirements and the social implications are greatest.

"To take the technical side first, the problems are twofold. First, there's picture quality. If a group of medical students in Boston is watching a cornea transplant in Dallas, they have to see details far beyond those required by laymen. And, in many cases, ETV requires a two-way street. Students may want to question the teacher, which means additional circuit capacity to provide this playback from the audience. Again, though, the technical problems are being mastered. There may be some new educational tools developed — but the promise of ETV goes well beyond mechanical marvels. The big hope is social, personal, human.

"The solutions proposed for our most pressing social problems are quite varied depending on whom you talk to. Most people agree, however, that good education for all is one of the things that must be accomplished somehow if we are to make any progress in this area. ETV seems to be one of the educational tools that may be useful here."

Turning back to his papers, James flips some pages at random. "That's what all these charts and theories on how to get more 'broadband capacity' come down to. ETV can put more teachers, better teachers, new and better teaching techniques, in front of more kids, more often, and at less cost. Our TV network gives us the base to build on toward these goals. When the educators are ready, we'll be ready."



### Way-Out Ways to Communicate

by Dr. John R. Pierce

As a longtime reader of science fiction, I've compared today's world with the predictions writers in the past have made about it. Somehow, prophecies and reality don't jibe.

What went wrong when past prophets tried to take science and technology into account in picturing the future?

In looking into the future, Aldous Huxley, for example, saw man overwhelmed by machines and by a social structure which seems to point clearly to a civilization of more compact and crowded cities, and to a domination of every aspect of man's life by technology.

But, looking at contemporary American life, we find that science, technology, and man himself have played a nasty trick on such prophecies. We can see that sprawling suburbia and a wandering population are chief characteristics of the nonstagnant part of our society.

What prophets of utopias and antiutopias lacked, partly, was a foreknowledge of unpredictable inventions. For example, the transistor and the vacuum tube have both had a profound effect on our civilization, as well as the laser, the maser, plastics, antibiotics, and a host of other unanticipated, and unanticipatable, discoveries and inventions which, at their inception, seemed mere toys of civilization. Consider the telephone, automobile, airplane and radio and television, all of which at first showed little promise of revolutionary impact.

In H. G. Wells' 1899 story, "When the Sleeper Wakes," the city grew dense and glass-enclosed, and the life of the average man was reduced to a drudgery of machine-tending and a cubbyhole off-the-job existence. The individual was helpless. Yet today we live in a world in which one individual created, in information theory, a field of study which permeates both sides of the Iron Curtain. Three other individuals, in inventing the transistor, laid the basis for a new industry in Japan and Hong Kong, as well as in the United States.

#### No anthill-dwellers we

Today we see something entirely different from the domed and collectivized anthills that Wells predicted in the Nineties. Science and technology may have equipped men with means for controlling and binding other men; but — and it's a big but — they have also provided a refuge in this world for the individual.

Three great freeing influences have been the automobile, the telephone

and electric power. When I was young, one could go conveniently as far as the streetcar ran. One vacationed as far from a railway station as public transportation took him.

Today, everything is different. The individual who wants to can escape into the countryside and live there very comfortably with the aid of an electric pump, bottled gas, oil heat and a septic tank. He can, if he desires, do a great deal of his shopping and socializing by phone.

For the rest, supermarkets and other stores have followed the drift of population away from the cities. And industry itself has had to solve traffic and labor problems via moves out of town.

And yet, people so spread out need not live in an isolated provincialism. However far they escape from former centers of population, television programs, political broadcasts, and press service dispatches follow them. The collectivizing influences of technology spread by wire and wireless over the whole country.

One might miss in this sprawl of civilization the play, the orchestra, the enlightened individual. But human contact is in part taken care of by the telephone and automobile, for one no longer boggles at the idea of calling friends or relatives across a state or across a continent, or at driving 50

Dr. Pierce is executive director of research at Bell Telephone Laboratories and author of eight books and scores of scientific articles.

miles to see a friend. Indeed, human relationships are easier than ever between people with common interests, however far apart they may live, rather than the old confinement to the immediate neighborhood.

But what of other intellectual and physical aspects of life?

Unlike the newspaper, and more than the journal, the book is the medium of expression of the talented individual. In a drugstore in a small city near where I live, I can find a better variety in paperbacks than was available among the books of the Carnegie Library in a town of similar size in which I lived years ago. A million paperbacks are sold in America every day through 95,000 mass outlets.

The variety which has come into music through long-playing records is even greater. The average man can and does purchase, for a reasonable price, fine recordings of more different compositions than either the Emperor or Prince Esterhazy had access to in Haydn's day. Or, he can hear these recordings played over a number of FM stations.

All of the technological means of collectivizing people which were foreseen at the beginning of the century have increased in strength. In their political and nationalistic manifestations, these means have brought men closer together within nations, and yet nations have been driven somewhat further apart through national rivalry.

This is the present as I see it. What of the future?

#### Prophets grow warier

I think we will have more of the same. But here I run a great risk, for that is what H. G. Wells said in the

Nineties. And that is how he erred.

I, too, may be overlooking very important and revolutionary things not yet discovered or invented—a risk unavoidable in prophecy. Ignoring the unknown, however, let's consider the foreseeable advances in the art of communication.

The importance of relatively cheaper communication need not be labored. Reduced rates have led to worthwhile personal conversations with distant children and relatives, and have greatly increased the amount of such communication. This lowered cost makes it more practical as well as more convenient to communicate rather than to travel, and this may save endless wear and tear on the man of the future. But it is not merely cheapening which will expand the role communication plays in our lives.

The linking of voice and data is bound to become more common. Today, in business conversations, we frequently write down information. Sometimes we dictate such material over a telephone. This is a primitive, fallible and exasperating resort. In the future, I am sure it will be common to intersperse typewritten material with spoken remarks, all carried over the same circuit. And this can extend into the home, in making reservations, in purchasing advertised goods, in the control of household devices, and in many other ways.

Finally, as communication becomes less specialized it will come to include computers as well as human beings.

Wrong-minded early prophets tended to think of the computer as being like a man, only more so. So we might once have thought of an automobile as an imitation of a horse, an airplane as an imitation of a bird. A horse is wonderful, and an automobile is wonderful, but they are wonderful in different ways. The horse excels in flexibility, self-sufficiency and intelligence; the automobile could not exist profitably without our elaborate system of highways. However, the automobile is wonderful in speed and endurance.

While a computer has played a good game of checkers, it has not played a good game of chess, nor has it proven theorems in competition with trained mathematicians. The computer has not excelled at old tasks. It has opened up the possibility of new tasks, and it has done new and surprising things that are very pertinent to the future.

Some of these things are keeping account, in one primitive and limited but accurate and very capacious mind, of the whole of some knotty problem which was formerly spread ineffectively among a host of human beings and a plethora of records. Thus, the computer can do a superb job in payroll, in accounting, in inventory control, and in reservations services.

And a computer can aid a human being in carrying out fatiguing chores. Once a group of entries has been reduced to a machine-readable form, it is no trouble for a computer to arrange them in a variety of indexes, such as alphabetically, or according to key words in the title.

#### Computers to talk, sing?

Computers have been used to generate articulate speech from a sequence of phonetic symbols. While the quality is not yet good, it is sure to be improved. In the future, it will be possible to query a computer by means of a sequence of letters or numbers and receive a spoken answer without the crude and complicated expedient of tape-recorded messages.

The computer has been pushed beyond this difficult process of generating articulate speech, to the generation of musical sounds. Here its versatility is without limit. In principle, the computer can generate any sound in existence. Through the computer, the composer will be given something more powerful than any orchestra which now exists, and more accessible than the orchestra which was at Haydn's beck and call. And the computer will certainly be available to the architect as a means for exploring the visual and structural consequences of various designs. As an editing and reproducing device, the computer could open more opportunities for publication to the talented writer.

#### Every phone a data-maker

Advances are bound to make computers more widely available for teaching in schools. But, beyond that, people will use computers from their homes—ordering, making reservations or seeking information. This may extend to banking as well as to other business transactions, so that nothing need go through the mail except actual goods. A combination of voice and punching buttons will do the rest.

With this sketch of the possible, of the realizable, in mind, I now ask whether this is a happy vision of the future. To me, the vision is exciting and desirable indeed.

In the future, government and business will be larger, life will be more complex. This is the price we must

pay for technological well-being.

But complexity will no longer mean centralization. Electrical communication, the computer as a recordkeeper, and rapid and flexible means of communication will make possible a civilization which can be highly amalgamated without being centralized.

And within this structure for those who have something of intellectual importance to offer, the options will be greater. The computer will take over "mental" routine as the machine has supplanted physical effort.

#### For artists: new frontiers

What will happen to the arts as society is increasingly interwoven and decentralized? I cannot believe that live, professional theater and opera can be maintained except as an input to television. Easier transportation may increase rather than diminish highly qualified touring artists and small groups, such as string quartets. And good art, in sight and sound, will become more widely available than before through improved recordings.

Thus, I can see a very bright future consistent with technology. In that future, technology, both through prosperity it can create and through the communication and travel it can afford, could erase those differences associated with region and race which have been little affected by exhortation and social action. Yet the same technology could, in a society without provincialism, give the individual a greatly increased range of climate and geography. It could provide new opportunities for creation, communication and self-expression.

Technology could bring these benefits, but will it? □





# A Man and His City

ay Garcia has known bitter days, but he is not a bitter man.

He is, in fact, an upbeat man in a downbeat time, a believer in the midst of apathy, a quiet but strong voice where the voices often shout, and a lover of a city reviled by some and sniggered at by others.

At the same time, he remains a realist. The sorrows that have visited him and his friends temper his view of the future. He hopes, but not too much.

The city he loves is troubled Los Angeles, and the bitter days came in his part of Los Angeles — the poverty-haunted complex of communities and peoples, predominantly Mexican-American, known loosely as "East Los Angeles."

East Los Angeles, where the average educational level falls just below that of next-door Watts, has been home to Ray for most of his 30 years. His family moved there from a higher rent district to the west when Ray was four. His parents hoped that reducing living costs would buy better medical care for Ray's older brother, ill with a respiratory disease. (Not long after the move, the boy died.)

It was in East Los Angeles that Ray, in pre-teen days, played hard through long summer evenings with as many as 30 kids from the same block. It was here that later he roamed the streets with a juvenile gang that was destined to produce its share of convicts and dope addicts.

It was here that he dropped out of high school at 16, then came back for night study that brought him a diploma and two years of college work majoring in sociology.

It was here that he met Corinne, his steady girl at 14 and his wife at 20 and, in Ray's words, "the strongest and best influence in my life." It was here that Ray and Corinne welcomed the births of four sons, and faced the death of one, a victim of leukemia at the age of seven months.

It is here that Ray, now a communications consultant for the Pacific Telephone and Telegraph Company, chooses to live with his family and, in every hour he can find, works to improve the quality of life in the community.

Topping the list of projects in which he's been a leader: the founding of a new boys' club in a neighborhood where none existed before, and the distribution to places of greatest need of 5,000 books contributed by telephone company people.

Modest to a fault, Ray Garcia nevertheless expresses without hesitation his ideas, based on his own experience, on the involvement of business and the individual in the problems of the city. This account of these ideas, plus some of the satisfactions and frustrations in his life, may suggest some answers and raise some new questions for other people as they wrestle with problems of urban society. . . .

## A Man and His City

#### by Ray Garcia

as told to Robert L. Varner



hen we first put the windows in the back wall at the new Salesian Boys' Club — and there are a lot of them; the wall is almost all glass — they all were broken out in a matter of days. Fortunately, one of the club board members owns a glass company and was willing to contribute new glass.

The second time we put the windows in they lasted about a week. The third time they lasted a month or more. Finally, this time, they've been in for many months and although some are cracked they haven't been knocked out altogether. I'm confident the windows are going to stay in. The kids gradually are getting used to playing and living where all this glass

lets in the sun. Gradually they're learning a new respect for property.

To me, those windows say something about the problems of East Los Angeles or all of Los Angeles or any city. The problems can't be licked quickly or easily. The people concerned need great patience and perseverance and understanding. But the problems can be licked.

The one most significant change in East Los Angeles since my boyhood days here, as I see it, is the feeling generally that we can improve the quality of our lives. It's a feeling that we don't have to consider ourselves different from anybody else — that, if we really want to, we can climb over any obstacle that may be placed in our way.

When I was very young the attitude was more passive. The attitude was, "Well, we are Mexicans and most Mexicans always have lived in poverty and

Mr. Garcia is a Pacific Telephone and Telegraph Company communications consultant. Mr. Varner is employee information supervisor with AT&T.

always will, so there's no point in struggling." This has changed. Actual living conditions in East Los Angeles haven't changed too much, but the attitude has. People are trying harder; their aspirations are higher; they have more hope.

Tied in with this is the fact that the poor people of the area are gaining a more effective voice in some of the programs for community betterment.

I don't think you can put a poor person with limited education in a very responsible position administering a program right off the bat. He can come in as an aide, however — and this is being done in many instances — and gradually gain the experience and training necessary in order to be able to take an administrative role.

And, whether they work as aides or not, the people of the community speak up more in the planning of the programs. They don't dictate what goes on, but they have something to say about it.

So there is hope.

There is also despair, I know, for many individuals. Of the 12 fellows I knew best as I grew up, only two have been steadily employed the last 10 years.

Louis, for instance, was a very handsome young man, an athlete, who started using dope while in junior high school. He is still a dope addict and I understand has since gotten his wife hooked also. One day last year when I was working with the library at the Variety Boys' Club, which we both attended as kids, I met Louis standing across the street from the club. He was trying to sneak a look at his son, who now attends the club, but didn't have the courage to come any closer because of his condition.

Another friend, Victor, started using dope when he was about 15, and has been in and out of jail since that time. He married my wife's closest friend and for a while seemed to be doing very well. But then he went back to dope and the situation deteriorated, there was no food for their three children, and the family had to go on relief. Victor is in prison now, and by chance was arrested the last time by a police

officer who also was a boyhood friend of ours.

And there are others. I consider these men my brothers, and because of them and other experiences I have had, I can never entertain any lightheaded or falsely optimistic outlook on life.

I have been very lucky in many ways — far more fortunate than many of my friends.

I was lucky, first of all, to learn the meaning and the value of working very hard from my father's background. As a cowboy in Mexico at the age of 12, he rode the range caring for the cattle from sun-up to sun-down, while my grandfather collected my father's pay from the Mormon rancher. This was the way my father contributed to their family.

e crossed the river to El Paso at the age of 16, thinking my grandfather would join him. My grandfather never did, although just before he died he traveled to Los Angeles to apologize to my father for having treated him as he did and to tell him he truly loved him as a son. In El Paso, where my father stayed for three years, over the western states, and finally in Los Angeles, he continued to work very hard, as a mason apprentice, a farm laborer, and at many other jobs. He still works hard today.

He told me the stories of how he worked as a boy, not in a bragging way but because I wanted to know. To me the stories said that if you have a job to do, and you really want to do it, you can.

I was fortunate also in that certain teachers and other older people took an interest in me. Mrs. Green, for instance, encouraged me in my art work in grade school days. She would put up as many as 10 of my pictures of trees on the bulletin board at the same time. Some years later a really fine teacher, Mrs. Crane, helped arrange for me to attend night school when I was still in my teens, although technically it was for adults only.

I was lucky, more than 10 years ago, to get a job with the Pacific Telephone Company, with its infinite variety of opportunity. It was good to start as a lineman, where, as had been the case for my father, I had to work very hard. This kind of experience adds extra drive for any job you may move into later.

My two years of Army experience worked to my benefit also. I was able to prove to myself that I had the abilities I had felt were mine — the abilities to write, to speak, to teach, to counsel. Army public information and NCO academy work gave me these opportunities.

The greatest personal influence came from Corinne. She set a beautiful example for me. She was just exactly the opposite of what I thought I was as a teen-ager. I drank and she didn't drink. I smoked and she didn't smoke. I didn't study and she studied. I finally decided that if she was really going to be my steady and we were going to get married some day, I would have to be a better guy because she deserved something better.

efore we were married she helped me see the quality our lives could have — she urged me to finish high school and go on to college — and since we've been married she's given me help all the way.

I had, and still have, strong faith in God. I once worked in a warehouse with six other fellows, all of whom were taking dope. At times they did their best to get me to try it "just once." I feel God helped me steer clear.

Those of us who are concerned with the problems of the city will need to work hard; we'll need faith; and certainly we can use a little luck if we're to deal with the problems.

In East Los Angeles, as in other cities, we face problems of employment, housing, and education, with education the greatest problem of all.

The employment situation has improved some. At one time prejudice blocked employment to a degree, but this is not really a factor today. There is some unemployment, but most people here are able to get jobs, and many hang on to them for long periods of time.

The bad feature, however, is that because of their lack of education, they generally are not able to progress to any position of responsibility. Many times they don't want responsibility because they feel inadequate, again as a result of the educational lack. If you are loading boxcars, as an example, you don't want to be a checker who sees that the orders are correct because your reading isn't good enough or your math isn't good enough and you're afraid of making errors in counting.

This means that the average family income in East



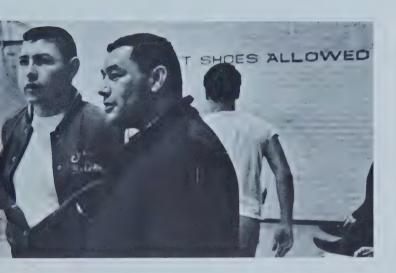
Los Angeles is low — on the order of the poverty mean, actually.

About 85 per cent of the housing is owned by absentee landlords. And about the same percentage is old, by California standards. Many of the single dwellings have given way to multi-unit low-rent housing projects, but a great number of the small, individual houses remain.

A lot of these are sub-standard, but they could be restored, rather than torn down. I think a slum is a slum by definition and partly because of the fact the people living in the homes often don't really know what they are living in. They are too close to them to see the beauty in the old homes.

I especially like the gingerbread on the small Victorian homes which are all over the place. These homes have style and character. I would like to see a program under which the fundamentals of architecture could be taught to the children in the area so that they would have an appreciation of the homes they live in and perhaps a desire to make them as they were when brand-new.

Along with this could go courses in remodeling and restoration — the practical steps to be taken in rented dwellings as well as those individually owned.



A related idea: an art class could paint these houses as an assignment, not as they are now but as they appear in the mind's eye, after restoration. An art show of paintings of this kind for all the residents of the area would give further impetus to restoration. A resident could be given the painting of his home as a reminder of what might be done.

Race relations pose no particular problem within East Los Angeles. Roughly 65 per cent of the people here are Mexican-American, some 20 per cent are of oriental background, mostly Japanese, some 10 per cent are Negro, with the balance a mixture, mostly of European extraction.

People here generally are indifferent to race or

color. If you live here, you belong here, and you're accepted. The only time I notice any distinction is when people try to define what I am. Those outside East Los Angeles, particularly, don't seem to feel comfortable just saying, "Ray Garcia is going to be here." They usually add, "By the way, he's that Mexican-American fellow I've been telling you about."

Most Mexican-Americans never doubt that they are Americans first, even though Spanish may be spoken in the home and there is pride in the Mexican heritage.

As in many other cities, the roots of most of our other problems in East Los Angeles reach back to the one big problem of education. The Mexican-American population here averages between eight and nine years of school completed, as compared to the Los Angeles Negro average of 10 years, and an average for the city as a whole of 12 years. The educational area is one in which the telephone company, with its pool of brainpower, has contributed and must continue to contribute, as should all business.

Sometimes people question the wisdom of business action in such a field. I feel, as a student of sociology and a member of the business community, that the two worlds need not be at odds at all. The one leads to greater sensitivity to human need and the other to workable, practical approaches to meet the need. Society requires both, and in some kind of reasonable balance and creative league.

A couple of years ago, when I was serving as chairman of the Pacific telephone community relations team in my home area, the Boyle Heights community of East Los Angeles, we dug pretty deeply into this question of education and other questions of concern. We visited much of the area and talked with many people, researching what the problems were from the point of view of the customer — telephone service problems and broader problems as well.

We talked at length with teachers, among others, and the consensus was that the reason the educational level was so low and there were so many drop-

outs was that the kids never learned to read well. They were never encouraged to read in the home. There was no environment in which they could see books, admire books, learn to like books, feel comfortable with books.

They would do some reading in grammar school and in junior high school, but they would never really read well. By the time a youngster got to high school he was in bad shape, because he couldn't understand what he was reading. He would try to fake it, and eventually the teachers would discoverhe was faking.

This inability to understand what he was reading smothered the learning process and confused the student to the point where he no longer wanted to attend school and out he would go. It was much easier to go to work digging a ditch or doing something else where little or no education was needed than to try to make a fresh start at learning to read. He now was too far behind.

With this need as our base, we have provided books in the places where the youngsters congregate. They weren't going to libraries, which often are miles from their homes, so we took libraries to them. Telephone company people contributed the books in response to our drive — about 5,000 books in all.

The team gave almost 1,000 books to the Variety Boys' Club, which tripled the size of their library and brought it up to date.

About 300 books, including some sets of encyclopedias, went to the Youth Opportunity Board of Greater Los Angeles, which is a Federal program for teaching dropouts and getting them back into school. It had no library at all until we gave them a start.

We helped the Halfway House start a library. This is a temporary residence, during a brief adjustment period, for former dope addicts who have just been released from jail.

The library at the Salesian Boys' Club was a telephone company project from the beginning, and about 2,000 books have recently been delivered and

are being categorized and shelved there.

Getting books into these and other places where the kids can feel comfortable with them will help a great deal, but much more needs to be done.

ur community relations team wanted to take two other steps in the educational area. One step would have motivated the youngsters through some kind of inexpensive slide-film presentation concentrating on East Los Angeles people who now have good jobs with the telephone company or other businesses. This could show the youngsters that there is opportunity for them if they work for it.

The other, and more fundamental, step would have provided individual tutoring to youngsters who needed it in reading or other subjects. People in business represent a great variety of expertise — just about anything the kids would require — and quite a number of telephone people, in fact, have volunteered to help in such a program.

We somehow have failed, however, at least so far, to get the motivation and tutoring programs off the ground. Perhaps we will make the grade yet.

So long as a real need is being met intelligently, business should not be reluctant, as I see it, to get into fields that may at first blush seem new or strange or where there may be the fear of stepping on somebody else's toes. The tutoring program, for example, would be welcomed, not only by the youngsters but by the school system if planned cooperatively.

Such programs are needed in the best interests of the community and business. I don't know a single boy in East Los Angeles who considers a businessman an idol. The idols are ballplayers, teachers, priests, social workers. Except for the ballplayers, these figures personally know and care about the boys as individuals and are known in the community.

Certainly we're not interested in being idolized. But being known for genuine concern about people is something else again.



Digging beneath the surface as a company, gaining true understanding of a basic problem such as education, and then acting on this understanding will, in the long run, not only help others individually, but also will improve employee recruiting prospects and will upgrade the community generally.

All of the problem-solving should not be left to government. To do this would be ducking individual and corporate citizenship responsibilities.

When families with moderately good incomes choose to stay in East Los Angeles I feel they can, in a small way, help improve the appearance and the environment of their neighborhood by what they do with their homes.

On the other hand, when people who can afford to make some improvements move away instead, they leave a vacuum. The vacuum usually is filled by people of lesser means so that there is a continuing process of deterioration in the housing.

But, even so, you don't have to live in East Los Angeles in order to be of some help here, particularly in something like tutoring. If someone comes in from outside and immediately offers too much advice, there is resentment, but if the outsider's attitude is right and he can give genuine help, he will be accepted.

Los Angeles, sprawling though it may be, is, after all, one city. I don't want to sound corny, but I love my city. Books and articles recently have dealt with Los Angeles as a psychologically unsound place in which to live. Our smog gets plenty of attention. The riots have been analyzed in print again and again. It's almost as though people are saying, when they know anyone will visit Los Angeles, "Oh, he's going where the riots were."

I don't minimize the problems underlying the riots. I know our city faces monumental problems. But there are voices I call "silent people" who speak for Los Angeles at such a time. These silent people are statues erected by our citizens over the years because they represent some truths we believe in.

For instance, a bust of Abraham Lincoln at the county courthouse speaks for justice.

A monument on Bunker Hill depicting a victory of Mormon soldiers during the early growing pains of our city speaks of our heritage, which is a rich and varied heritage, San Francisco to the contrary — not exclusively a Mexican heritage by any means.

In Forest Lawn, where our baby boy, Paris, is buried, there are statues of two little girls that speak of hope. The one called the duck baby reminds me of the poem that talks of a child looking up, holding wonderment in his hands like a cup.

With all of our problems in Los Angeles, we do look up, we do hold wonderment like a cup.

The people I am concerned with are truly interested in solving their own problems. This is the most important thing to remember, I feel. They have much to contribute to our society, and if they can know opportunity, we all will gain.



#### Telpak, WATS rates revised

New rates for bulk communications services will become effective May 1 under tariffs that AT&T recently filed with the Federal Communications Commission. AT&T has proposed the elimination of Telpak A and B, bulk communications services of 12 and 24 channels respectively, revised privateline telephone rates, increased private-line telegraph rates and rates for teletypewriter equipment installed on customer's premises, and introduced a new service for high-speed data and facsimile transmission. AT&T also submitted proposed increases in Telpak C and D rates, bulk communications offerings of 60 and 240 channels.

In another service change, Interstate Wide Area Telephone Service (WATS), which offers long distance calling at fixed monthly rates for either full-time or measured-time service, has been expanded to include inward service. At the same time, the minimum number of hours of measured-time WATS has been cut from 15 to 10 per month, with the minimum charge reduced proportionately. Rates for additional hours of calling have been reduced by five to nine per cent.

#### Accurate synthetic speech produced

Accurate synthetic speech is now being produced with the aid of a computer-generated model of the vocal tract developed by Dr. Cecil H. Coker of Bell Laboratories and Professor O. Fujimura of the University of Tokyo.

The model, stored in a computer, is actually a geometric description of vocal tract areas as they are shaped to produce various sounds. When syn-

thesizing speech, a researcher can see an outline of the vocal tract displayed on an oscilloscope and, at the same time, hear the sound which corresponds to the displayed shape. By making adjustments at the computer console, the researcher can change the shape and sound simultaneously. Thus, synthetic speech can be improved with both visual and aural aids.



This research is being conducted to obtain basic information about speech sounds which may be useful in devising a more efficient means of encoding speech signals and transmitting them over communications lines. It also may help in the development of a practical speaking machine for "reading out" data stored in, or generated by, computers.

#### International rates cut

A telephone call to the United Kingdom now costs one-tenth of what it cost 40 years ago when overseas service was inaugurated.

New station-to-station rates that went into effect in February now enable customers to call Europe at costs 25 to 37 per cent lower than the former \$12 person-to-person rate for a three-minute call. Rates for time beyond the initial three-minute period have also been cut. The changes will produce annual savings of \$6.9 million for U. S. customers.

AT&T has also instituted new rates that will save U. S. and Canadian telephone users an estimated \$2 million annually. Reductions in three-minute rates range from five cents to \$1.10.

#### **Business seminar opens**

A second Bell System Business Communications Seminar will open in New York City this spring. Patterned after a similar facility in Chicago, the seminar is designed to give executives — representing all segments of business, industry and government service — an insight into the ways modern communications can contribute more effectively to corporate planning, growth and profit. One- and two-day seminar sessions inspect the implications of communications in relation to the information explosion.

#### Improve synthetic quartz growing

An improved method of growing manmade quartz crystals, to replace natural quartz crystals in all communications devices, has been developed by Albert A. Ballman and Robert A. Laudise of Bell Laboratories and David W. Rudd of Western Electric.

The new method produces synthetic quartz crystals that control frequencies with the same stability and precision as natural quartz crystals. Synthetic quartz crystals grown by the new method will also produce substantial savings.

#### New technical education center

A new Bell System Technical Education Center will be opened this fall in Lisle, Illinois near Bell Laboratories' recently completed Indian Hill facility. The center is an extension of the Bell System's program of continuing education for employees on scientific and technical assignments. Unique in the field of continuing engineering education, the center will provide "tailormade" instruction and assistance for

all employee levels of Bell System engineering organizations.

One of the major assignments of the center will be to help newly employed engineering graduates to become communications engineers. Other courses will assist engineers in keeping up to date with changes in technology.

The education center will also train instructors who will take the continuing education program into the individual telephone companies.

#### Two laboratories completed, manufacturing plant under construction

Bell Telephone Laboratories recently completed two new research and development centers in Holmdel, N. J. and Indian Hill, Ill.

Designed by the late Eero Saarinen for the utmost flexibility, the Holmdel laboratory deals with customers' telephone equipment, transmission equipment, data communications, and communications science studies.

The Indian Hill Laboratory, near Chicago and Western Electric's Hawthorne Works, is devoted to development of the electronic switching systems that ultimately will replace the electromechanical systems now in the nation's communications network.

Meanwhile, Western Electric is expanding its production facilities in the Southwest. The new Phoenix, Arizona plant, which will manufacture wire and cable products for Bell companies, will become WE's 15th major manufacturing facility when it opens late this year.

Initially, the Phoenix plant will produce up to 42 billion conductor feet of cable a year, and will ultimately have an annual capacity of approximately 70 BCF. When fully operational, the plant will employ nearly 1,000 persons, most of whom will be recruited locally. Training of new machinists is already in progress.



Bell Labs' new Indian Hill laboratory in Illinois

#### New sound spectrograph developed

A faster, more accurate, and more versatile sound spectrograph — a device that produces a printed diagram of the frequencies and amplitudes of sound — has been designed by A. J. Presti, of Bell Telephone Laboratories.

The new spectrograph can make spectrograms directly from standard mylar magnetic recording tape in 80 seconds. Earlier models produced a spectrogram in five minutes and required the intermediate step of transferring the taped information to plated drums or metal loops. Use of the



standard tape has resulted in better fidelity and lower background noise.

Sound spectrographs — conceived at Bell Labs more than 20 years ago — have long been valuable for a variety of research projects. They have been used to analyze speech, diagnose diseased hearts or malfunctioning jet engines, investigate noise to improve soundproofing, provide better communications equipment, and identify voices, aircraft, ships or submarines.

#### **Excitonic molecule found**

The first experimental observation of the excitonic molecule has been made at Bell Telephone Laboratories.

The excitonic molecule, which was found in silicon, is made of two electrons and two positively charged entities that solid-state physicists refer to as "holes." Holes are unoccupied energy levels that electrons could fill. Unlike ordinary molecules in which two or more atoms combine, the excitonic molecule is a stable complex of two pairs of electrons and holes.

#### Science aids widely accepted

The Bell System's Aids to High School Science program has received a strong vote of confidence from physics educators, according to a recent study of use and effectiveness. The study indicated that U. S. high school physics teachers have accepted both the approach and the material used in the five demonstration units designed for classroom, use, and the four experiments for students of outstanding ability and interest. Subjects range from wave behavior and magnetism to crystals.

The study found that two-thirds of the physics teachers tested are using some science aids materials. It also indicated that the teaching level of the material appears to be well matched to educators' requirements, and that continued development of similar teaching aids is desired by virtually all educators who have used units in the program. The teachers also endorsed the planning and execution of presentation meetings with Bell System representatives.

#### Intelstat II is 100th

Bell Laboratories and Western Electric recently celebrated the 100th launch from Cape Kennedy of a satellite steered into orbit by a BTL-WE guidance system. This occurred with the launch of the new Pacific satellite, Intelstat II, on January 11. The occasion, which was marked by ceremonies at Cape Kennedy, was also the 10th anniversary of the Bell System guidance facility at the Cape.

The BTL-WE guidance system was used to steer the satellite into a transfer orbit from which it was later placed in a synchronous equatorial orbit by the firing of the satellite's apogee motor. The successful guidance of Intelstat II increases the Bell System's record of successes in space orbits to more than 260.

#### Silicon transistor improved

Silicon transistors able to amplify at higher frequencies than any presently in use have been developed by Dr. Rudolf Schmidt of Bell Laboratories. Improved fabrication techniques, allowing the internal dimensions of the transistors to be reduced, are responsible for their ability to operate at higher frequencies without developing short circuits.







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